Claims

1. A strain of *Francisella* species wherein a gene which encodes an enzyme in the purine pathway has been inactivated, and which is able to produce a protective immune response in an animal, for use as a live prophylactic or therapeutic vaccine against infection by said *Francisella* species.

2. A strain according to claim 1 wherein the gene encodes an enzyme, which is active early in the purine pathway.

3. A strain according to claim 1 wherein the gene is one of the first six enzymes in the purine pathway.

4. A strain according to claim 1, 2 or 3 wherein the gene is *purF*.

5. A strain according to any of claims 1 to 4 wherein said gene is inactivated by complete or partial deletion mutation or by insertional mutation.

6. A strain according to any one of the preceding claims which is a strain of *Francisella tularensis*.

7. A strain according to claim 6 which is a strain of *Francisella tularensis* subspecies *tularensis*.

8. A strain according to claim 6 which is a strain of *Francisella tularensis* subspecies *novicida*.

9. A pharmaceutical composition comprising a live strain of *Francisella* species wherein a gene, which encodes an enzyme in the purine pathway, has been inactivated, and which is able to produce a protective immune response in an animal, in combination with a pharmaceutically acceptable carrier.

10. A composition according to claim 9 wherein the gene encodes an enzyme, which is active early in the purine pathway.

11. A composition according to claim 9 or 10 wherein the gene is one of the first six enzymes in the purine pathway

12. A composition according to any of claims 9, 10 or 11 wherein the gene is *purF*.

13. A composition according to any of claims 9 to 12wherein said gene is inactivated by complete or partial deletion mutation or by insertional mutation.

14. A pharmaceutical composition according to any one of claims 9 to 13 wherein the strain is a strain of *Francisella tularensis*.

15. A pharmaceutical composition according to claim 13 wherein the strain is a strain of *Francisella tularensis* subspecies *tularensis* or a strain of *Francisella tularensis* subspecies *novicida*.

16. The use of a strain of *Francisella* species wherein a gene which encodes an enzyme in the purine pathway has been inactivated, and which is able to produce a protective immune response in an animal, in the preparation of a live prophylactic or therapeutic vaccine against infection by said *Francisella* species.

17. The use according to claim 16 wherein the gene encodes an enzyme, which is active early in the purine pathway.

18. The use according to claim 16 or 17 wherein the gene is one of the first six enzymes in the purine pathway

19. The use according to claim 16, 17 or 18 wherein the gene is *purF*.

20. The use according to claim any of claims 16 to 19 wherein said gene is inactivated by complete or partial deletion mutation or by insertional mutation.

21. The use according to any one of the preceding claims wherein the strain is a strain of *Francisella tularensis*.

22. The use according to claim 21 wherein the strain is a strain of *Francisella tularensis* subspecies *tularenis* or a strain of *Francisella tularensis* subspecies *novicida*.

23. A method of preventing or treating infection by a *Francisella* species, which method comprises administering to an animal an effective amount of a live strain according to any one of claims 1 to 8 or a composition according to any one of claims 9 to 15.

24. A method according to claim 23 for preventing or treating infection by *Francisella tularensis*, wherein the strain of *Francisella* species used in the method is a strain of *Francisella tularensis* subspecies *tularensis* or *Francisella tularensis* subspecies *novicida*.

25. A method for preparing a strain according to any one of claims 1 to 8, which comprises transforming a strain of *Francisella* species so as to inactivate said gene using cryotransformation.

26. A strain of Francisella tularensis subspecies tularensis wherein a gene that encodes a *purA* gene has been inactivated.